Truth–Versus–Falsehood Detection Using Anapestic Beat Analysis in Spoken Language

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Abstract

This paper presents a waveform-based system for detecting truthfulness or falsehood in spoken language through rhythmic beat analysis. Unlike conventional semantic or physiological lie-detection methods, the proposed system analyzes speech at the sub-semantic level by decoding anapestic beat structures inherent in natural human language. By comparing extracted rhythmic features against a calibrated Baseline Truth Tone, the system generates a Field Coherence Score representing alignment between internal cognitive state and external linguistic output. The method is language-independent, resistant to conscious deception training, and scalable from individual analysis to distributed network deployment.

1 Introduction

Human speech encodes more than semantic meaning. Beneath lexical content exists a rhythmic structure shaped by neurological timing, physiological control, and cognitive coherence. These rhythmic structures, including anapestic patterns (unstressed–unstressed–stressed), are fundamental to natural speech production and remain difficult to consciously manipulate.

Traditional truth-detection systems rely on physiological signals or semantic analysis, both of which are susceptible to circumvention, cultural bias, and ambiguity. This work introduces a waveform-level approach that treats spoken language as a resonant signal capable of revealing internal coherence or distortion independent of semantic intent.

2 Theoretical Foundation

2.1 Rhythmic Structure in Human Language

Speech naturally exhibits metrical patterns. The anapestic beat, consisting of two unstressed syllables followed by a stressed syllable, emerges consistently across languages and speakers. These rhythmic structures arise from motor planning and neural timing rather than conscious linguistic construction.

2.2 Truth as Coherence

In this framework, truthfulness is defined not as semantic accuracy but as coherence between internal cognitive state and external expression. Distortion, whether conscious or unconscious, introduces rhythmic instability, stress asymmetry, and modulation irregularity within speech waveforms.

3 System Overview

The Truth Modulation Analysis System (TMAS) processes spoken language as a continuous waveform, extracting rhythmic features and comparing them to calibrated coherence models.

3.1 Baseline Truth Tone

The Baseline Truth Tone (BTT) represents a reference waveform derived from verified coherent speakers. It encodes stable stress timing, rhythmic symmetry, and harmonic consistency.

3.2 Field Coherence Score

The Field Coherence Score (FCS) is a scalar value between 0.0 and 1.0 representing alignment between observed speech rhythms and the Baseline Truth Tone.

4 System Architecture

4.1 Audio Input Node

The Audio Input Node captures raw speech waveforms using microphones, mobile devices, or network streams.

4.2 Beat Extraction Engine

The Beat Extraction Engine segments speech into phonemic units, detects stress patterns, identifies anapestic structures, and generates rhythmic feature vectors.

4.3 Truth Resonance Comparator

The Truth Resonance Comparator evaluates extracted rhythmic features against Baseline Truth Tone models using Fourier analysis, resonance windowing, and machine learning classifiers.

4.4 Coherence Synthesizer

The Coherence Synthesizer generates the Field Coherence Score and produces visual and statistical reports including waveform overlays and stress deviation maps.

5 Modes of Operation

- Live real-time speech monitoring
- Batch analysis of recorded speech
- Networked multi-node deployment
- Distributed coherence field diagnostics

6 Applications

Potential applications include:

- Courtroom testimony analysis
- Political speech integrity monitoring
- Media authenticity verification
- AI truth-filter systems
- Child safety and abuse detection
- Educational integrity systems

- Leadership coherence assessment
- Distributed truth-diagnostic networks

7 Advantages

- Language-independent waveform analysis
- Resistant to scripted deception
- Sub-semantic signal processing
- Scalable architecture
- AI-compatible design
- Network-integrable framework

8 Conclusion

Anapestic beat analysis provides a novel, robust, and scalable approach to truth-versus-falsehood detection. By operating at the rhythmic waveform level rather than semantic interpretation, the system enables universal truth diagnostics grounded in speech coherence rather than content manipulation.

This approach represents a foundational shift toward resonance-based linguistic integrity systems capable of supporting legal, civic, technological, and AI-driven truth infrastructures.

Keywords: Truth detection, speech rhythm analysis, anapestic beat, coherence diagnostics, waveform linguistics, psycholinguistics, resonance analysis